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Reading acquisition during game-based training in Dutch

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Introduction

- GraphoGame (GG, Richardson & Lyytinen, 2014) is a serious computer game designed to train grapheme-phoneme correspondences in children. Such a training can boost reading abilities in languages with transparent writing systems like Finnish.
- There is fewer evidence that GG can enhance reading in less transparent writing systems as well, perhaps because phonological awareness (PA) has more impact on reading in more opaque languages than the knowledge of grapheme-phoneme associations.

In our study we investigated, which factors might predict the effectiveness of GG training in first graders learning to read a rather opaque language (i.e., Dutch).



Materials and methods

- For 5 to 7 weeks, 107 first graders (mean age 6;3) played a Dutch adaptation of GG for 8-12 minutes per day, while an active control group ($N=107$) played a Math version of the game.
- Children were recruited from the north-eastern part of the Netherlands (Groningen), and the Dutch/Flemish speaking part of Belgium (Gent).
- The game mostly trains skills such as grapheme-phoneme association, PA, whole word reading and spelling. It contains ~1000 items, ranging simple and complex graphemes, syllables, monosyllabic words with and without consonant clusters, as well as non-words.

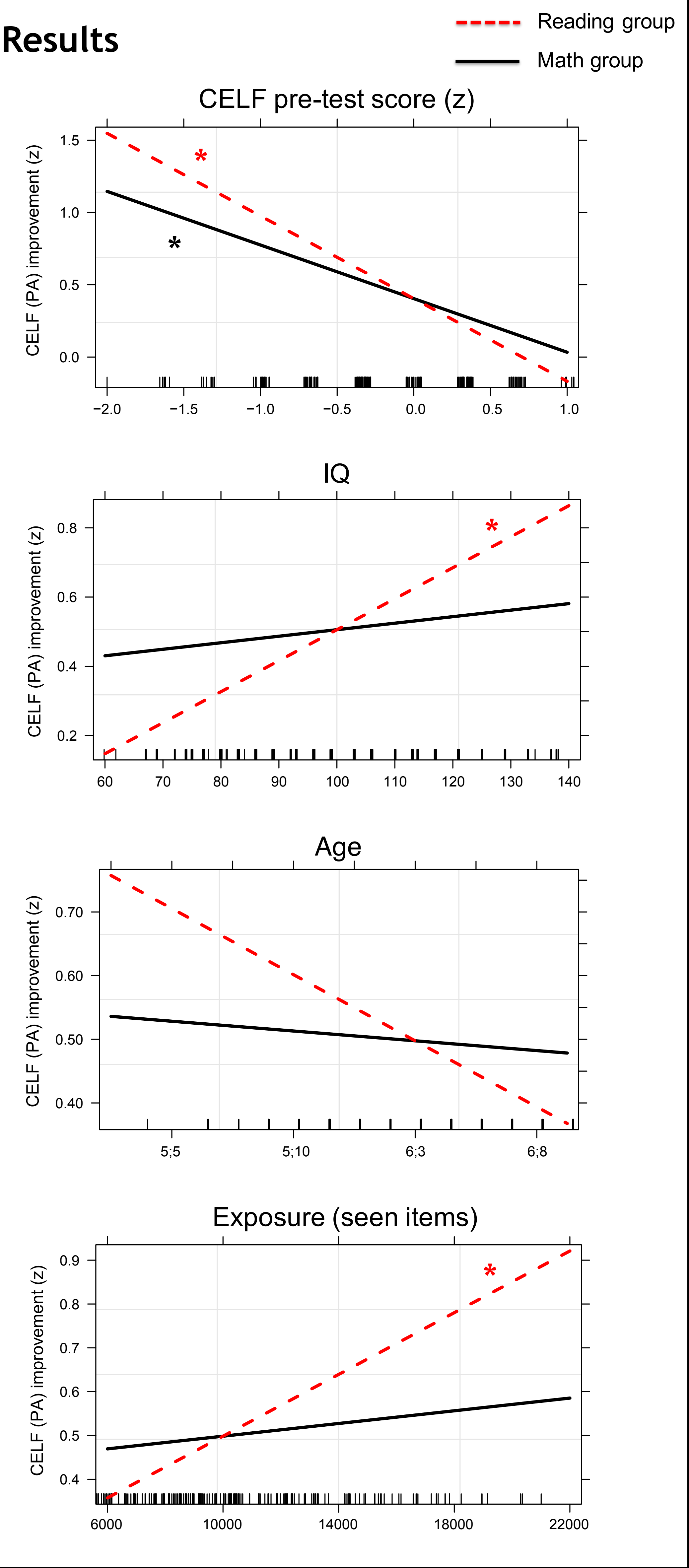
Assessments:

- CELF-4-NL Phonological Awareness (Kort et al., 2008)
- PROEF Phonological Awareness (Elen, 2006)
- RAN of colours and objects (van den Bos, 2003)
- SON-R 6-40 (Tellegen et al., 2014) non-verbal IQ estimate

Here, we present the data of the effect of playing a reading game vs. a math game on the improvement in phonological awareness as measured by the *CELF* using mixed-effects regression ($N=214$).

Condition	Read	Math
<i>N</i>	107	107
Gender (f/m)	49/58	43/64
Age (y;m)	6;3	6;3
(range)	(5;1-7;2)	(5;1-6;9)
Non-verbal IQ	98.6	99.1
Minutes played	212	208
Sessions played	27	27
Letter Knowledge	13.5	16.4
PROEF percentile	50	54
CELF percentile	43	46
RAN colours (s)	70	64
RAN objects (s)	77	74

Results



Which children benefit most from serious gaming in first grade?

- GraphoGame had a larger effect on Phonological Awareness than playing a math game for children with low pre-test scores, an above average IQ, below average age (5;1 - 6;3 years), and an exposure to the game of upwards of 3.5 hours.
- Overall, PA scores increased moderately during the initial months of the first grade (by about 0.5 standard scores), independently of whether children played GG or not.

Conclusion

When learning to read in an opaque language, a certain group of children does benefit from GG training. We believe that serious gaming is able to reach children who have difficulties with reading acquisition by training phonological awareness skills and increasing exposure to relevant reading materials.

To specify further characteristics of this group and the nature of the mechanism underlying GG-based improvement in phonological awareness, we plan to further extend the analysis to in-game assessments, reaction time investigation, playing data, as well as to neurophysiological (EEG) measurements.



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